

**REGION 10 ANNOTATED VERSION -- JUNE 12, 2000
DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION**

**RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA725)**

Current Human Exposures Under Control

Facility Name: Boeing Renton
Facility Address: 800 N 6th St., Renton, WA 98055
Facility EPA ID #: WAD 009 262 171

1. Has **all** available relevant/significant information on known and reasonably suspected releases to soil, groundwater, surface water/sediments, and air, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

- x If yes - check here and continue with #2 below.
- If no - re-evaluate existing data, or
- if data are not available skip to #6 and enter "IN" (more information needed) status code.

EI determinations are intended to be a "snapshot" of current site conditions, and should NOT require additional data to be gathered at the time an EI determination is made. Even if available data are clearly insufficient to determine the nature and extent of contamination or whether cleanup standards are met, it is perfectly acceptable to check "yes" for question #1 as long as whatever data currently available has been considered. When data currently available are considered but are insufficient for EI determinations, such a conclusion should be indicated in question 3 for pathways and question 4 for exposures.

Note: Even though only currently available data should be used for EI determinations, the process of making EI determinations may well identify data gaps that need to be filled through the corrective action process.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future. _____

Definition of "Current Human Exposures Under Control" EI

A positive "Current Human Exposures Under Control" EI determination ("YE" status code) indicates that there are no "unacceptable" human exposures to "contamination" (i.e., contaminants in concentrations in excess of appropriate risk-based levels) that can be reasonably expected under current land- and groundwater-use conditions (for all "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Current Human Exposures Under Control" EI are for reasonably expected human exposures

Current Human Exposures Under Control
Environmental Indicator (EI) RCRIS code (CA725)
Page 2

under current land- and groundwater-use conditions ONLY, and do not consider potential future land- or groundwater-use conditions or ecological receptors. The RCRA Corrective Action program's overall mission to protect human health and the environment requires that Final remedies address these issues (i.e., potential future human exposure scenarios, future land and groundwater uses, and ecological receptors).

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

2. Are groundwater, soil, surface water, sediments, or air **media** known or reasonably suspected to be **"contaminated"**¹ above appropriately protective risk-based "levels" (applicable promulgated standards, as

In many cases, available sampling and analytical data will be insufficient to fully document whether or not contaminant levels in the various media are above or below appropriate risk-based levels. For purposes of making EI determinations, it is entirely appropriate to use sound professional judgement as to whether particular media are or are not contaminated. For example, at a site with metal contamination in groundwater, professional judgement could easily be used to determine that no air (indoor or outdoor) contamination had occurred. This is particularly important when a phased approach is used for site characterization or corrective action - if characterization of a particular portion of a site has been deferred under a phased approach on the basis that that area is not believed to be contaminated and this belief is reasonably supported by an analysis of historical activities, process knowledge or other information, then it is quite reasonable to conclude that media in that area are not "contaminated" as part of a site-wide EI determination. Should data contradicting the initial phased-investigation presumption be gathered later in the site characterization process, it can easily be reflected in an updated EI determination. Deferral of a particular area as being low priority but still or likely to be contaminated should be reflected by a "no" or "in" EI.

well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action (from SWMUs, RUs or AOCs)?

	<u>Yes</u>	<u>No</u>	<u>?</u>	<u>Rationale / Key Contaminants</u>
Groundwater	<u> x </u>	<u> </u>	<u> </u>	<u> TCE, PCE, VC, cis-1,2-DCE, TPH </u>
Air (indoors) ²	<u> </u>	<u> x </u>	<u> </u>	<u> </u>
Surface Soil (e.g., <2 ft)	<u> x </u>	<u> </u>	<u> </u>	<u> TCE, PCE, VC, cis-1,2-DCE, TPH </u>
Surface Water	<u> </u>	<u> </u>	<u> x </u>	<u> </u>
Sediment	<u> </u>	<u> x </u>	<u> </u>	<u> </u>
Subsurf. Soil (e.g., >2 ft)	<u> x </u>	<u> </u>	<u> </u>	<u> TCE, PCE, VC, cis-1,2-DCE, TPH </u>
Air (outdoors)	<u> </u>	<u> x </u>	<u> </u>	<u> </u>

The rationale/key contaminants should have a brief note of the "principle threat" contaminants (those that most significantly drive cleanup decisions), as well as a reference to key documents, if any. A note as to which particular risk-based standard is being used as the basis of comparison should also be included. For complex documents, a note to the particular section, table, etc. from which data or standards are selected should be provided, as it is often difficult to verify data out of context.

Current Human Exposures Under Control
Environmental Indicator (EI) RCRIS code (CA725)

Page 3

- _____ If no (for all media) - skip to #6, and enter "YE," status code after providing or citing appropriate "levels," and referencing sufficient supporting documentation demonstrating that these "levels" are not exceeded.
- ___x___ If yes (for any media) - continue after identifying key contaminants in each "contaminated" medium, citing appropriate "levels" (or provide an explanation for the determination that the medium could pose an unacceptable risk), and referencing supporting documentation.
- _____ If unknown (for any media) - skip to #6 and enter "IN" status code.

Rationale and Reference(s): RFI in 2001 (Reference 1) and the supplemental remedial investigations (Reference 2) identified several areas contaminated with VOCs and TPHs at the levels that corrective measure (CM) is required. Especially, AOC-90 area was heavily contaminated (Reference 3). Even though most of the contaminated soils were removed from this area in May 2004 (Reference 4), groundwater is still contaminated with high TCE (3,600 ug/L), VC (400 ug/L), cis-1,2-DCE (18,000 ug/L) and TPHs (G-16,000 ug/L and D-6,400 ug/L) (Reference 5). AOC-1/2 area was also heavily contaminated with TCE and VC, but the soils were removed in November 2005. After the soil removal, enhanced bioremediation was implemented in this area by adding hydrogen releasing compounds to treat groundwater (Reference 6). Groundwater is contaminated with VC (2,800 ug/L) and cis-1,2-DCE (2,900 ug/L) (Reference 5). Several other areas (SWMU-172/174, Buildings 4-78/79 area, Former Fuel Farm, AOC-3, AOC-4, AOC-60, AOC-92 and AOC-93) are also contaminated with VOCs and TPHs. The contamination levels in these areas are lower than AOC-90 and AOC-1/2, but CM is still required (Reference 1). Surface water contamination is unknown at this time, and more information is requested.

References: 1. Remedial Investigation Report, August 2001, by Weston; 2. Feasibility Study Work Plan, April 2004, by Geomatrix; 3. AOC-90 Interim Report Building 4-65 Yard, September 2000, by Weston; 4. Boeing Renton AOC-90 Interim Action Results Memorandum, July 8, 2004, by Geomatrix; 5. Quarterly Groundwater Monitoring Report, August 2006, by Geomatrix; 6. Boeing Renton AOC-001 and AOC-002 Interim Action Results Memorandum, prepared by Geomatrix, January 27, 2006

Footnotes:

¹ "Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriately protective risk-based "levels" (for the media, that identify risks within the acceptable risk range).

² Recent evidence (from the Colorado Dept. of Public Health and Environment, and others) suggest that unacceptable indoor air concentrations are more common in structures above groundwater with volatile contaminants than previously believed. This is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration necessary to be reasonably certain that indoor air (in structures located above (and adjacent to) groundwater with volatile contaminants) does not present unacceptable risks.

"YE" environmental indicator. Go figure.

Current Human Exposures Under Control
Environmental Indicator (EI) RCRIS code (CA725)

Page 4

3. Are there **complete pathways** between "contamination" and human receptors such that exposures can be reasonably expected under the current (land- and groundwater-use) conditions?

Summary Exposure Pathway Evaluation Table

Potential **Human Receptors** (Under Current Conditions)

For sediments (if not other media like surface or groundwater), exposure should consider the potential for subsistence food source exposures, in addition to traditional exposure routes such as direct contact or direct ingestion.

"Contaminated" Media	Residents	Workers	Day-Care	Construction	Trespassers	Recreation	Food ³
Groundwater	<u>no</u>	<u>no</u>	<u>no</u>	<u>no</u>			<u>no</u>
Air (indoors)							
Soil (surface, e.g., <2 ft)	<u>no</u>	<u>no</u>	<u>no</u>	<u>no</u>	<u>no</u>	<u>no</u>	<u>no</u>
Surface Water	<u>no</u>	<u>no</u>			<u>no</u>	<u>yes</u>	<u>yes</u>
Sediment							
Soil (subsurface e.g., >2 ft)				<u>no</u>			<u>no</u>
Air (outdoors)							

Instructions for Summary Exposure Pathway Evaluation Table:

1. Strike-out specific Media including Human Receptors' spaces for Media which are not "contaminated") as identified in #2 above.
2. enter "yes" or "no" for potential "completeness" under each "Contaminated" Media -- Human Receptor combination (Pathway).
3. Indirect Pathway/Receptor (e.g., vegetables, fruits, crops, meat and dairy products, fish, shellfish, etc.)

Note: In order to focus the evaluation to the most probable combinations some potential "Contaminated" Media - Human Receptor combinations (Pathways) do not have check spaces ("___"). While these combinations may not be probable in most situations they may be possible in some settings and should be added as necessary.

- ___ If no (pathways are not complete for any contaminated media-receptor combination) - skip to #6, and enter "YE" status code, after explaining and/or referencing condition(s) in-place, whether natural or man-made, preventing a complete exposure pathway from each contaminated medium (e.g., use optional Pathway Evaluation Work Sheet to analyze major pathways).
- __x__ If yes (pathways are complete for any "Contaminated" Media - Human Receptor combination) - continue after providing supporting explanation.
- ___ If unknown (for any "Contaminated" Media - Human Receptor combination) - skip to #6 and enter "IN" status code

Current Human Exposures Under Control
Environmental Indicator (EI) RCRIS code (CA725)
Page 5

Rationale and Reference(s): Since this site is completely paved except tree or shrub areas and secured by fence, the neighborhood residents or facility workers will not be exposed to contaminated soil or groundwater. Exposure to temporary construction workers is likely but not an issue since the facility health and safety plan will be implemented during any construction work. However, recreation use or fish consumption in the Cedar River or Lake Washington may result in exposure to contaminated groundwater potentially being discharged into the River and Lake. Air contamination is not an issue at this site. Sediment contamination was evaluated as part of the RFI (Reference 1). Ecology believes that the level of contamination is not high enough to require CM and Boeing is not the contributor of the contamination.

Reference: 1. Outfall, Shoreline and Nearshore Sediments Sampling Report, dated November 1999, prepared by Weston

- 4 Can the **exposures** from any of the complete pathways identified in #3 be reasonably expected to be **“significant”**⁴ (i.e., potentially “unacceptable” because exposures can be reasonably expected to be: 1) greater in magnitude (intensity, frequency and/or duration) than assumed in the derivation of the acceptable “levels” (used to identify the “contamination”); or 2) the combination of exposure magnitude (perhaps even though low) and contaminant concentrations (which may be substantially above the acceptable “levels”) could result in greater than acceptable risks)?

 x If no (exposures can not be reasonably expected to be significant (i.e., potentially “unacceptable”) for any complete exposure pathway) - skip to #6 and enter “YE” status code after explaining and/or referencing documentation justifying why the exposures (from each of the complete pathways) to “contamination” (identified in #3) are not expected to be “significant.”

See Semantic Alert above.

 If yes (exposures could be reasonably expected to be “significant” (i.e., potentially “unacceptable”) for any complete exposure pathway) - continue after providing a description (of each potentially “unacceptable” exposure pathway) and explaining and/or referencing documentation justifying why the exposures (from each of the remaining complete pathways) to “contamination” (identified in #3) are not expected to be “significant.”

 If unknown (for any complete pathway) - skip to #6 and enter “IN” status code

Rationale and Reference(s): At this time, Ecology does not have sufficient information to determine whether the contaminated groundwater from AOC-1/2, AOC-60 and AOC-90 is being discharged into Lake Washington or the Cedar River. However, Ecology believes that current human exposure to the surface water, if contaminated, is not significant based on the groundwater sampling data collected from the shoreline wells and the surrounding wells during the quarterly groundwater monitoring events (Reference 1), the supplemental remedial investigation (Reference 2), and output from the risk analysis for exposure to recreational use and fish consumption. EPA Region 10 assisted Ecology with this analysis of risk.

Contaminated soils were removed from the AOC-1/ 2 area and AOC-90 area in November 2005 and May 2004, respectively. After the soil removal, enhanced bioremediation was implemented in these areas by adding hydrogen releasing compounds to treat groundwater (References 3 and 4).

Reference: 1. Quarterly Groundwater Monitoring Reports; 2. Feasibility Study Work Plan, April 2004, by Geomatrix; 3. Boeing Renton AOC-001 and AOC-002 Interim Action Results Memorandum, by Geomatrix, January 27, 2006; 4. Boeing Renton AOC-90 Interim Action Results Memorandum, July 8, 2004, by Geomatrix

- ⁴ If there is any question on whether the identified exposures are “significant” (i.e., potentially “unacceptable”) consult a human health Risk Assessment specialist with appropriate education, training and experience.

Current Human Exposures Under Control
Environmental Indicator (EI) RCRIS code (CA725)
Page 6

- 5 Can the “significant” exposures (identified in #4) be shown to be within acceptable limits?

- _____ If yes (all “significant” exposures have been shown to be within acceptable limits) - continue and enter “YE” after summarizing and referencing documentation justifying why all “significant” exposures to “contamination” are within acceptable limits (e.g., a site-specific Human Health Risk Assessment).
- _____ If no (there are current exposures that can be reasonably expected to be “unacceptable”)- continue and enter “NO” status code after providing a description of each potentially “unacceptable” exposure.
- _____ If unknown (for any potentially “unacceptable” exposure) - continue and enter “IN” status code

The response to this question should include a brief description of the analysis and assumptions used in arriving at whatever conclusion is reached. The description does not have to be particularly detailed, but it should allow the reader to gain a basic understanding of the reasoning employed by the decision-maker.

Rationale and Reference(s):

Current Human Exposures Under Control

In general, EI’s (if not cleanup standards themselves) can be met through a combination of reduction of contaminant concentrations (assuming that concentrations have been unacceptable) and (physical) engineering or institutional controls that interrupt an exposure pathway. For purposes of EI determinations, however, institutional or engineering controls do not need to have the sophistication, permanence, or legal defensibility as would be necessary for a final corrective action remedy. Rather, they need to be functional and reasonable - should the controls later be found to be no longer effective, the finding can easily be reflected in an updated EI determination.

An example might be the existence of off-site groundwater contamination that might pose risks to utility workers outside of the facility boundary. In this instance, evidence of an agreement between the facility and the utility that excavations would not occur in the contaminated area without appropriate protective gear would be acceptable for meeting the human exposures controlled EI.

Environmental Indicator (EI) RCRIS code (CA725)

Page 7


6. Check the appropriate RCRIS status codes for the Current Human Exposures Under Control EI event code (CA725), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (and attach appropriate supporting documentation as well as a map of the facility):

☒ YE - Yes, "Current Human Exposures Under Control" has been verified. Based on a review of the information contained in this EI Determination, "Current Human Exposures" are expected to be "Under Control" at the Boeing Renton facility, EPA ID # WAD 009 262 171, located at Renton, Washington under current and reasonably expected conditions. This determination will be re-evaluated when the Agency/State becomes aware of significant changes at the facility.

☐ NO - "Current Human Exposures" are NOT "Under Control."


☐ IN - More information is needed to make a determination.

Completed by


Byung Maeng
Environmental Engineer

Date: August 29, 2006

Supervisor


Julie Sellick
Supervisor
Hazardous Waste and Toxics Reduction Section
Department of Ecology

Date: August 30, 2006

Locations where References may be found:

Department of Ecology – Northwest Regional Office in Bellevue, Washington
The Boeing Company's Renton Plant
City of Renton Library

Contact telephone and e-mail numbers:

Byung Maeng
(425) 649-7253
bmae461@ecy.wa.gov

FINAL NOTE: THE HUMAN EXPOSURES EI IS A QUALITATIVE SCREENING OF EXPOSURES AND THE DETERMINATIONS WITHIN THIS DOCUMENT SHOULD NOT BE USED AS THE SOLE BASIS FOR RESTRICTING THE SCOPE OF MORE DETAILED (E.G., SITE-SPECIFIC) ASSESSMENTS OF RISK.

REGION 10 ANNOTATED VERSION -- JUNE 12, 2000
DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

Interim Final 2/5/99

RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA750)

Migration of Contaminated Groundwater Under Control

Facility Name: Boeing Renton
Facility Address: 800 N 6th St. Renton, WA 98055
Facility EPA ID #: WAD 009 262 171

1. Has all available relevant/significant information on known and reasonably suspected releases to the groundwater media, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

☒ If yes - check here and continue with #2 below.
☐ If no - re-evaluate existing data, or
☐ if data are not available, skip to #8 and enter "IN" (more information needed) status code.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Migration of Contaminated Groundwater Under Control" EI

A positive "Migration of Contaminated Groundwater Under Control" EI determination ("YE" status code) indicates that the migration of "contaminated" groundwater has stabilized, and that monitoring will be conducted to confirm that contaminated groundwater remains within the original "area of contaminated groundwater" (for all groundwater "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Migration of Contaminated Groundwater Under Control" EI pertains ONLY to the physical migration (i.e., further spread) of contaminated ground water and contaminants within groundwater (e.g., non-aqueous phase liquids or NAPLs). Achieving this EI does not substitute for achieving other stabilization or final remedy requirements and expectations associated with sources of contamination and the need to restore, wherever practicable, contaminated groundwater to be suitable for its designated current and future uses.

Migration of Contaminated Groundwater Under Control
Environmental Indicator (EI) RCRIS code (CA750)
Page 2

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

2. Is **groundwater** known or reasonably suspected to be “contaminated”¹ above appropriately protective “levels” (i.e., applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action, anywhere at, or from, the facility?

☒ If yes - continue after identifying key contaminants, citing appropriate “levels,” and referencing supporting documentation.

☐ If no - skip to #8 and enter “YE” status code, after citing appropriate “levels,” and referencing supporting documentation to demonstrate that groundwater is not “contaminated.”

☐ If unknown - skip to #8 and enter “IN” status code.

Rationale and Reference(s): RFI in 2001 (Reference 1) and the supplemental remedial investigations (Reference 2) identified several areas contaminated with VOCs and TPHs at the levels that corrective measure (CM) is required. Especially, AOC-90 area was heavily contaminated (Reference 3). Even though most of the contaminated soils were removed from this area in 2004 (Reference 4), groundwater is still contaminated with high TCE (3,600 ug/L), VC (400 ug/L), cis-1,2-DCE (18,000 ug/L) and TPHs (G-16,000 ug/L and D-6,400 ug/L) (Reference 5). In the AOC-1/2 area, groundwater is still contaminated with VC (2,800 ug/L) and cis-1,2-DCE (2,900 ug/L) even if the contaminated soils were removed in November 2005 (Reference 5). Several other areas (SWMU-172/174, Buildings 4-78/79 area, Former Fuel Farm, AOC-3, AOC-4, AOC-60, AOC-92 and AOC-93) are also contaminated with VOCs and TPHs. Contamination levels in these areas are lower than AOC-90 and AOC-1/2, but CM is still required (Reference 1).

References: 1. Remedial Investigation Report, August 2001, by Weston; 2. Feasibility Study Work Plan, April 2004, by Geomatrix; 3. AOC-90 Interim Report Building 4-65 Yard, September 2000, by Weston; 4. Boeing Renton AOC-90 Interim Action Results Memorandum, July 8, 2004, by Geomatrix; 5. Quarterly Groundwater Monitoring Report, August 2006, by Geomatrix; 6. Boeing Renton AOC-001 and AOC-002 Interim Action Results Memorandum, prepared by Geomatrix, January 27, 2006

Footnotes:

¹“Contamination” and “contaminated” describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriate “levels” (appropriate for the protection of the groundwater resource and its beneficial uses).

Migration of Contaminated Groundwater Under Control
Environmental Indicator (EI) RCRIS code (CA750)

Page 3

3. Has the **migration** of contaminated groundwater **stabilized** (such that contaminated groundwater is expected to remain within "existing area of contaminated groundwater"² as defined by the monitoring locations designated at the time of this determination)?

This question focuses ONLY on the movement of contaminated groundwater, not the level of contamination. A "YES" response should be arrived at if, through interpretation of groundwater flow data or sound professional judgement, groundwater contamination can be shown to not be expanding in spatial extent. It is perfectly acceptable to have a "YE" groundwater EI if:

- 1) contaminated groundwater is located off-site but not migrating further;
- 2) contaminated groundwater is contaminated above cleanup standards, but not migrating further;
- 3) natural attenuation is occurring such that the rate of attenuation (through any of the acceptable attenuation mechanisms and in accordance with EPA's Monitored Natural Attenuation Guidance, Directive 9200.4-17 - December 1997 Use of Monitored Natural Attenuation at Corrective Action Sites) is such that the outer boundaries of the plume are not expanding.

_____ If yes - continue, after presenting or referencing the physical evidence (e.g., groundwater sampling/measurement/migration barrier data) and rationale why contaminated groundwater is expected to remain within the (horizontal or vertical) dimensions of the "existing area of groundwater contamination"²).

_____ If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the "existing area of groundwater contamination"²) - skip to #8 and enter "NO" status code, after providing an explanation.

__x__ If unknown - skip to #8 and enter "IN" status code.

Rationale and Reference(s): Sampling results from the AOC-60 and AOC-1/2 monitoring wells located along the Cedar River and Lake Washington shorelines indicated non-detects of any contaminants in groundwater (Reference 1). Since these wells are located close to the shorelines, the non-detects may be the result of dilution by surface water intrusion or higher lab reporting limit. Therefore, Boeing needs to demonstrate that the non-detects are not the results of dilution, but degradation, and lower reporting limit has to be used for future analysis.

VC concentrations in the Cedar River Trail Park near AOC-90 exceed the acceptable discharge level (3.7 ug/L) determined by the risk analysis for exposure to recreational use and fish consumption, assisted by EPA-10. The highest VC concentration detected in the area where sheetpile wall is not installed in the Park is 11 ug/L (Reference 2). Ecology requested that Boeing install the additional monitoring wells as proposed in the draft CMS report as soon as possible, and submit groundwater sampling data to be obtained from this area to evaluate potential migration of the contaminated groundwater to the River.

Reference: 1. Quarterly Groundwater Monitoring Reports; 2. Feasibility Study Work Plan, April 2004, by Geomatrix

2 “existing area of contaminated groundwater” is an area (with horizontal and vertical dimensions) that has been verifiably demonstrated to contain all relevant groundwater contamination for this determination, and is defined by designated (monitoring) locations proximate to the outer perimeter of “contamination” that can and will be sampled/tested in the future to physically verify that all “contaminated” groundwater remains within this area, and that the further migration of “contaminated” groundwater is not occurring. Reasonable allowances in the proximity of the monitoring locations are permissible to incorporate formal remedy decisions (i.e., including public participation) allowing a limited area for natural attenuation.

**Migration of Contaminated Groundwater Under Control
Environmental Indicator (EI) RCRIS code (CA750)**

Page 4

4. Does “contaminated” groundwater **discharge** into **surface water** bodies?
_____ If yes - continue after identifying potentially affected surface water bodies.

_____ If no - skip to #7 (and enter a “YE” status code in #8, if #7 = yes) after providing an explanation and/or referencing documentation supporting that groundwater “contamination” does not enter surface water bodies.

_____ If unknown - skip to #8 and enter “IN” status code.

Rationale and Reference(s): _____

Migration of Contaminated Groundwater Under Control
Environmental Indicator (EI) RCRIS code (CA750)
Page 5

5. Is the **discharge** of “contaminated” groundwater into surface water likely to be “**insignificant**” (i.e., the maximum concentration³ of each contaminant discharging into surface water is less than 10 times their appropriate groundwater “level,” and there are no other conditions (e.g., the nature, and number, of discharging contaminants, or environmental setting), which significantly increase the potential for unacceptable impacts to surface water, sediments, or eco-systems at these concentrations)?

_____ If yes - skip to #7 (and enter “YE” status code in #8 if #7 = yes), after documenting: 1) the maximum known or reasonably suspected concentration³ of key contaminants discharged above their groundwater “level,” the value of the appropriate “level(s),” and if there is evidence that the concentrations are increasing; and 2) provide a statement of professional judgement/explanation (or reference documentation) supporting that the discharge of groundwater contaminants into the surface water is not anticipated to have unacceptable impacts to the receiving surface water, sediments, or eco-system.

_____ If no - (the discharge of “contaminated” groundwater into surface water is potentially significant) - continue after documenting: 1) the maximum known or reasonably suspected concentration³ of each contaminant discharged above its groundwater “level,” the value of the appropriate “level(s),” and if there is evidence that the concentrations are increasing; and 2) for any contaminants discharging into surface water in concentrations³ greater than 100 times their appropriate groundwater “levels,” the estimated total amount (mass in kg/yr) of each of these contaminants that are being discharged (loaded) into the surface water body (at the time of the determination), and identify if there is evidence that the amount of discharging contaminants is increasing.

_____ If unknown - enter “IN” status code in #8.

Rationale and Reference(s): _____

³ As measured in groundwater prior to entry to the groundwater-surface water/sediment interaction (e.g., hyporheic) zone.

Migration of Contaminated Groundwater Under Control
Environmental Indicator (EI) RCRIS code (CA750)
Page 6

6. Can the **discharge** of “contaminated” groundwater into surface water be shown to be “**currently acceptable**” (i.e., not cause impacts to surface water, sediments or eco-systems that should not be allowed to continue until a final remedy decision can be made and implemented⁴)?

_____ If yes - continue after either: 1) identifying the Final Remedy decision incorporating these conditions, or other site-specific criteria (developed for the protection of the site’s surface water, sediments, and eco-systems), and referencing supporting documentation demonstrating that these criteria are not exceeded by the discharging groundwater; OR 2) providing or referencing an interim-assessment, appropriate to the potential for impact, that shows the discharge of groundwater contaminants into the surface water is (in the opinion of a trained specialists, including ecologist) adequately protective of receiving surface water, sediments, and eco-systems, until such time when a full assessment and final remedy decision can be made. Factors which should be considered in the interim-assessment (where appropriate to help identify the impact associated with discharging groundwater) include: surface water body size, flow, use/classification/habitats and contaminant loading limits, other sources of surface water/sediment contamination, surface water and sediment sample results and comparisons to available and appropriate surface water and sediment “levels,” as well as any other factors, such as effects on ecological receptors (e.g., via bio-assays/benthic surveys or site-specific ecological Risk Assessments), that the overseeing regulatory agency would deem appropriate for making the EI determination.

_____ If no - (the discharge of “contaminated” groundwater can not be shown to be “**currently acceptable**”) - skip to #8 and enter “NO” status code, after documenting the currently unacceptable impacts to the surface water body, sediments, and/or eco-systems.

_____ If unknown - skip to 8 and enter “IN” status code.

When considering discharge of groundwater to surface water, it is important to remember that some discharges may be considered acceptable - it is not necessary to demonstrate that there are no discharges, or that groundwater meets surface water criteria at the point of discharge, as may be the case with final cleanup levels. As with human exposures controlled and other groundwater criteria, sound professional judgement may be used in evaluating the impact of groundwater to surface water.

The GW/SW component of the 750 EI really has three parts: 1) is there a discharge; 2) is the discharge insignificant; and 3) is the discharge currently acceptable (questions 4-6, respectively). A YE EI may be obtained if appropriate responses can be made through following this three-step analysis (no discharge, discharge insignificant, or discharge acceptable, respectively). Note that the level of supporting analysis and/or data increases as you progress through these three steps - a finding that a discharge is acceptable for a particular water body requires a considerably more complex analysis than a finding that there is no discharge.

Another point to recognize is that surface water issues often involve ecological risk considerations, and that such ecological evaluations often require specialized professional evaluation. Never the less, the quantity of data and effort required for analysis of groundwater/surface water EI questions should not be significantly different than what is required for human exposures or other groundwater questions. Evaluation of surface water from an EI perspective should not require a disproportionate effort.

Migration of Contaminated Groundwater Under Control
Environmental Indicator (EI) RCRIS code (CA750)

Page 7

Rationale and Reference(s): _____

⁴ Note, because areas of inflowing groundwater can be critical habitats (e.g., nurseries or thermal refugia) for many species, appropriate specialist (e.g., ecologist) should be included in management decisions that could eliminate these areas by significantly altering or reversing groundwater flow pathways near surface water bodies.

⁵ The understanding of the impacts of contaminated groundwater discharges into surface water bodies is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration to be reasonably certain that discharges are not causing currently unacceptable impacts to the surface waters, sediments or eco-systems.

Migration of Contaminated Groundwater Under Control
Environmental Indicator (EI) RCRIS code (CA750)

Page 8

7. Will groundwater **monitoring** / measurement data (and surface water/sediment/ecological data, as necessary) be collected in the future to verify that contaminated groundwater has remained within the horizontal (or vertical, as necessary) dimensions of the “existing area of contaminated groundwater?”

_____ If yes - continue after providing or citing documentation for planned activities or future sampling/measurement events. Specifically identify the well/measurement locations which will be tested in the future to verify the expectation (identified in #3) that groundwater contamination will not be migrating horizontally (or vertically, as necessary) beyond the “existing area of groundwater contamination.”

_____ If no - enter “NO” status code in #8.

_____ If unknown - enter “IN” status code in #8.

Rationale and Reference(s): _____

**Migration of Contaminated Groundwater Under Control
Environmental Indicator (EI) RCRIS code (CA750)**

Page 8

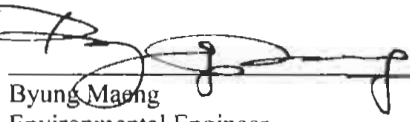
8. Check the appropriate RCRIS status codes for the Migration of Contaminated Groundwater Under Control EI (event code CA750), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (attach appropriate supporting documentation as well as a map of the facility).

_____ YE - Yes, "Migration of Contaminated Groundwater Under Control" has been verified. Based on a review of the information contained in this EI determination, it has been determined that the "Migration of Contaminated Groundwater" is "Under Control" at the _____ facility, EPA ID # _____, located at _____. Specifically, this determination indicates that the migration of "contaminated" groundwater is under control, and that monitoring will be conducted to confirm that contaminated groundwater remains within the "existing area of contaminated groundwater" This determination will be re-evaluated when the Agency becomes aware of significant changes at the facility.

_____ NO - Unacceptable migration of contaminated groundwater is observed or expected.

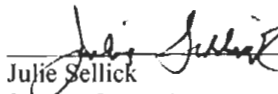
 x IN - More information is needed to make a determination.

Completed by


Byung Maeng
Environmental Engineer

Date: August 29, 2006

Supervisor


Julie Sellick
Section Supervisor
Hazardous Waste and Toxics Reduction Section
Department of Ecology

Date August 30, 2006

Locations where References may be found:

Department of Ecology, Northwest Regional Office in Bellevue, Washington
The Boeing Company's Renton Plant
City of Renton Library

Contact telephone and e-mail numbers

Byung Maeng
(425) 649-7253
bmae461@ecy.wa.gov